WHAT IS CLAIMED IS:

1. A driver circuit for driving a permanent-magnet electric motor, comprising:

an inverter for generating an electric current to be applied to the permanent-magnet motor, according to a commanded voltage value applied thereto;

a motor-drive-current detector operable to detect the drive current of the motor;

a current detector operable to detect a d-axis current and a q-axis current which are respectively an exciting current component and a torque current component of the detected drive current; and

a controller operable to calculate a d-axis current difference between the detected d-axis current and a commanded d-axis current value, and a q-axis current difference between the detected q-axis current and a commanded q-axis current value, said controller being further operable to calculate a d-axis difference signal which is a function of a d-axis input voltage of the motor and is not a function of a q-axis input voltage of the motor, and a q-axis difference signal which is a function of the q-axis input voltage and is not a function of the d-axis input voltage, said controller controlling said inverter on the basis of the calculated d-axis and q-axis difference signals, such that the d-axis and q-axis difference signals are zeroed.

2. A driver circuit according to claim 1, wherein said controller generates a value xd as said d-axis difference signal, and a value xq as said q-axis difference signal, the values xd and xq being represented by the following equation:

$$\begin{pmatrix} xd \\ xq \end{pmatrix} = \begin{pmatrix} R-\omega dLd & -\omega Lq \\ \omega Ld & R-\omega dLq \end{pmatrix} \begin{pmatrix} jd \\ jq \end{pmatrix} + \begin{pmatrix} \omega dLd & 0 \\ 0 & \omega dLq \end{pmatrix} \begin{pmatrix} idr-id \\ iqr-iq \end{pmatrix}$$

$$\frac{d}{dt}\begin{pmatrix} jd \\ jq \end{pmatrix} = \begin{pmatrix} -\omega d & 0 \\ 0 & -\omega d \end{pmatrix} \begin{pmatrix} jd \\ jq \end{pmatrix} + \begin{pmatrix} \omega d & 0 \\ 0 & \omega d \end{pmatrix} \begin{pmatrix} idr-id \\ iqr-iq \end{pmatrix}$$

wherein id is said d-axis current,

iq is said q-axis current,

idr is said commanded d-axis current value,

iqr is said commanded q-axis current value,

vd is a d-axis voltage applied to the motor,

Vq vd is a q-axis voltage applied to the motor,

Ld is an inductance of the d-axis of the motor,

Lq is an inductance of the q-axis of the motor,

R is an electric resistance of the motor,

ω is an angular velocity of a rotor of the motor,

Φ is a number of magnetic cross fluxes of a permanent magnet of the motor,

NAB jd is a d-axis state quantity of said non-interference processor of said controller,

NAB jq is a q-axis state quantity of said non-interference processor of said controller, and

ω d is a coefficient.

3. A driver circuit according to claim 1, wherein said controller is operable for calculating said d-axis difference signal and said q-axis difference signal in a low frequency range, said controller controlling said inverter on the basis of the calculated d-axis and q-axis difference signals, such that the d-axis and q-axis difference signals are zeroed.

4. A driver circuit according to claim 3, wherein said controller generates a value xd as said d-axis difference signal, and a value xq as said q-axis difference signal, the values xd and xq being represented by the following equation:

$$\begin{pmatrix} xd \\ xq \end{pmatrix} = \begin{pmatrix} R & \omega Lq \\ -\omega Ld & R \end{pmatrix} \begin{pmatrix} idr - id \\ iqr - iq \end{pmatrix}$$

wherein id is said d-axis current,

iq is said q-axis current,

idr is said commanded d-axis current value,

iqr is said commanded q-axis current value,

Ld is an inductance of the d-axis of the motor,

Lq is an inductance of the q-axis of the motor,

R is an electric resistance of the motor, and

ω is an angular velocity of a rotor of the motor.

5. A driver circuit for driving a permanent-magnet electric motor, by comprising:

an inverter for generating an electric current to be applied to the motor, according to a commanded voltage value applied thereto;

a motor-drive-current detector operable to detect a drive current of the motor;

a current detector operable to detect a d-axis current and a q-axis current which are respectively an exciting current component and a torque current component of the detected drive current;

a current-difference calculator operable to calculate a d-axis current difference between the detected d-axis current and a commanded d-axis current value, and a q-axis current difference between the detected q-axis current and a commanded q-axis current value;

a non-interference processor operable to calculate a d-axis difference signal which is a function of a d-axis input voltage of the motor and is not a function of a q-axis input voltage of the motor, and a q-axis difference signal which is a function of the q-axis input voltage and is not a function of the d-axis input voltage; and

an inverter controller operable to control said inverter on the basis of the calculated d-axis and q-axis difference signals, such that the d-axis and q-axis difference signals are zeroed.

6. A driver circuit according to claim 5, wherein that said non-interference processor generates a value xd as said d-axis difference signal, and a value xq as said q-axis difference signal, the values xd and xq being represented by the following equation:

$$\begin{pmatrix} xd \\ xq \end{pmatrix} = \begin{pmatrix} R-\omega dLd & -\omega Lq \\ \omega Ld & R-\omega dLq \end{pmatrix} \begin{pmatrix} jd \\ jq \end{pmatrix} + \begin{pmatrix} \omega dLd & 0 \\ 0 & \omega dLq \end{pmatrix} \begin{pmatrix} idr-id \\ iqr-iq \end{pmatrix}$$

$$\frac{d}{dt}\begin{pmatrix} jd \\ jq \end{pmatrix} = \begin{pmatrix} -\omega d & 0 \\ 0 & -\omega d \end{pmatrix} \begin{pmatrix} jd \\ jq \end{pmatrix} + \begin{pmatrix} \omega d & 0 \\ 0 & \omega d \end{pmatrix} \begin{pmatrix} idr-id \\ iqr-iq \end{pmatrix}$$

wherein id is said d-axis current,

iq is said q-axis current,

idr is said commanded d-axis current value,

iqr is said commanded q-axis current value,

vd is a d-axis voltage applied to the motor,

vq is a q-axis voltage applied to the motor,

Ld is an inductance of the d-axis of the motor,

Lq is an inductance of the q-axis of the motor,

R is an electric resistance of the motor,

ω is an angular velocity of a rotor of the motor,

Φ is a number of magnetic cross fluxes of the permanent magnet,

jd is a d-axis state quantity of said non-interference processor,

jq is a q-axis state quantity of said non-interference processor, and

ω d is a coefficient.

7. A driver circuit according to claim 6, wherein that said non-interference processor is operable on the basis of the calculated d-axis and q-axis current differences, for calculating said d-axis difference signal and said q-axis difference signal in a low frequency range.

8. A driver circuit according to claim 7, wherein that said non-interference processor generates a value xd as said d-axis difference signal, and a value xq as said q-axis difference signal, the values xd and xq being represented by the following equation:

$$\begin{pmatrix} xd \\ xq \end{pmatrix} = \begin{pmatrix} R & \omega Lq \\ -\omega Ld & R \end{pmatrix} \begin{pmatrix} idr - id \\ iqr - iq \end{pmatrix}$$

wherein id is said d-axis current,

iq is said q-axis current,

idr is said commanded d-axis current value,iqr is said commanded q-axis current value,

Ld is an inductance of the d-axis of the motor,

Lq is an inductance of the q-axis of the motor,

R is an electric resistance of the motor,

ω is an angular velocity of a rotor of the motor .

9. A driver circuit for driving a permanent-magnet electric motor, comprising:

an inverter for generating an electric current to be applied to the permanent-magnet motor, according to a commanded voltage value applied thereto;

motor-drive-current detecting means for detecting the drive current of the motor;

current detecting means for detecting a d-axis current and a q-axis current which are respectively an exciting current component and a torque current component of the detected drive current;

current-difference calculating means for calculating a d-axis current difference between the detected d-axis current and a commanded d-axis current value, and a q-axis current difference between the detected q-axis current and a commanded q-axis current value;

non-interference processing means for calculating a d-axis difference signal which is a function of a d-axis input voltage of the motor and is not a function of a q-

axis input voltage of the motor, and a q-axis difference signal which is a function of the q-axis input voltage and is not a function of the d-axis input voltage; and

inverter control means for controlling said inverter on the basis of the calculated d-axis and q-axis difference signals, such that the d-axis and q-axis difference signals are zeroed.

10. A method of controlling a driver circuit for driving an electric motor, characterized by comprising the steps of:

detecting a drive current of the motor;

detecting a d-axis current and a q-axis current which are respectively an exciting current component and a torque current component of the detected drive current;

calculating a d-axis current difference between the detected d-axis current and a commanded d-axis current value, and a q-axis current difference between the detected q-axis current and a commanded q-axis current value;

calculating a d-axis difference signal which is a function of a d-axis input voltage of the motor and is not a function of a q-axis input voltage of the motor and a q-axis difference signal which is a function of the q-axis input voltage and is not a function of the d-axis input voltage; and

controlling an inverter on the basis of the calculated d-axis and q-axis difference signals, such that the d-axis and q-axis difference signals are zeroed.

11. A method according to claim 10, wherein said step of calculating a d-axis difference signal and a q-axis difference signal comprises calculating a value xd as said d-axis difference signal, and a value xq as said q-axis difference signal, according to the following equation:

$$\begin{pmatrix} xd \\ xq \end{pmatrix} = \begin{pmatrix} R-\omega dLd & -\omega Lq \\ \omega Ld & R-\omega dLq \end{pmatrix} \begin{pmatrix} jd \\ jq \end{pmatrix} + \begin{pmatrix} \omega dLd & 0 \\ 0 & \omega dLq \end{pmatrix} \begin{pmatrix} idr-id \\ iqr-iq \end{pmatrix}$$

$$\frac{d}{dt}\begin{pmatrix} jd \\ jq \end{pmatrix} = \begin{pmatrix} -\omega d & 0 \\ 0 & -\omega d \end{pmatrix} \begin{pmatrix} jd \\ jq \end{pmatrix} + \begin{pmatrix} \omega d & 0 \\ 0 & \omega d \end{pmatrix} \begin{pmatrix} idr-id \\ iqr-iq \end{pmatrix}$$

wherein id is said d-axis current,

iq is said q-axis current,

idr is said commanded d-axis current value,

iqr is said commanded q-axis current value,

vd is a d-axis voltage (actually applied to the motor),

vq is a q-axis voltage (actually applied to the motor),

Ld is an inductance of the d-axis of the motor,

Lq is an inductance of the q-axis of the motor,

R is an electric resistance of the motor,

ω is an angular velocity of a rotor of the motor,

Φ is a number of magnetic cross fluxes of the permanent magnet,

jd is a d-axis state quantity of said non-interference processor,

jq is a q-axis state quantity of said non-interference processor, and

ωd is a coefficient.

12. A method according to claim 10, wherein said step of calculating a d-axis difference signal and a q-axis difference signal comprises calculating, on the basis of the calculated d-axis and q-axis current differences, said d-axis difference signal and said q-axis difference signal in a low frequency range.

13. A method according to claim 12, wherein said step of calculating a d-axis difference signal and a q-axis difference signal comprises calculating a value xd as said d-axis difference signal, and a value xq as said q-axis difference signal, according to the following equation:

$$\begin{pmatrix} xd \\ xq \end{pmatrix} = \begin{pmatrix} R & \omega Lq \\ -\omega Ld & R \end{pmatrix} \begin{pmatrix} idr - id \\ iqr - iq \end{pmatrix}$$

wherein id is said d-axis current,

iq is said q-axis current,

idr is said commanded d-axis current value,

iqr is said commanded q-axis current value,

Ld is an inductance of the d-axis of the motor,

Lq is an inductance of the q-axis of the motor,

R is an electric resistance of the motor, and

ω is an angular velocity of a rotor of the motor.